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PROJECT 2 ABSTRACT

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Native FHB resistance in cultivated wheat has been widely explored and utilized in wheat breeding. There is an urgent need of additional resistance sources to strengthen and diversify the defense of wheat to FHB. One of the strategies to achieve that is to search for novel resistance genes from wheat-related alien species and incorporate them into the wheat genome. Here we propose to identify and produce wild relative-derived wheat materials with FHB resistance and to incorporate alien resistance genes into wheat for germplasm development. In addition, we will map the alien chromatin harboring FHB resistance genes and develop user-friendly molecular markers to assist selection of FHB resistance in wheat breeding. The specific objectives of this project are to:

1) Identify alien species-derived FHB resistance genes and incorporate them into the wheat genome;
2) Map the alien chromatin containing FHB resistance genes incorporated into the wheat genome and minimize linkage drag associated with resistance genes; and
3) Develop breeding-friendly spring wheat germplasm with FHB resistance and associated molecular markers for MAS.

This will be done using an effective meiotic homoeologous recombination-based gene introgression approach we have developed. We will screen the materials at early generations under greenhouse environments and verify resistance of the introgression lines under field conditions in ND. Also, we will submit the resistant lines for DON testing. Introgression of alien FHB resistance genes into spring wheat can strengthen and diversify its resistance to FHB. Breeder-friendly alien introgression lines with FHB resistance and potentially reduced DON will be developed and immediately made available to the spring wheat breeding programs for variety development. To date, we have provided over 200 breeder-friendly spring wheat germplasm lines with FHB resistance from different sources and various agronomic traits to the spring wheat breeding programs for variety development. Also, we have identified and developed additional wheat-alien species derivatives with non-*fhb1* FHB resistance genes derived from relatives of wheat. We will further characterize those non-*fhb1* resistance sources and incorporate them into adapted spring wheat backgrounds. Further chromosome manipulation, if necessary, will be performed to minimize deleterious effects associated with alien chromatin. We anticipate developing additional spring wheat germplasm with FHB resistance and low DON accumulation from those resistance sources.